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Thermomagnetic constraints on the composition of titanomagnetites with exsolution structures of magnetite-ulvospinel

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Abstract

A new method is proposed for the evaluation of the composition of a magnetite-ulvospinel solid solution and the dimension of exsolution structures of this solid solution series, based on the analysis of thermomagnetic curves of saturation magnetization after the first and repeated heatings and their comparison with theoretical curves. The process of partial homogenization of titanomagnetite exsolution products is assumed to occur as a result of sample heating. Theoretical curves modeling the homogenization process of the exsolution products, depending on the heating rate and final temperature, are obtained through variation of the half width of exsolution products and the ratio of the half width of the ulvospinel lamella to that of the magnetite matrix. Application of this method to seven trap samples from western Yakutia indicated reasonable agreement between the results of microprobe and thermomagnetic analyses.